Claims

1. A method of calibrating a multi-section tuneable laser to a specific frequency, the method comprising the steps of:
   a) forming a first discrete matrix of output values from the laser, the matrix being defined by an optical characteristic of the output of the laser at specific determining tuning currents, and
   b) processing the matrix so as to determine stable operating points within the matrix, the stable operating points defining specific frequencies where the laser may be operated.

2. The method as claimed in claim 1 wherein the output values from the laser are measurements indicative of the characteristics of the laser, the characteristics being selected from one or more of the following:
   a) the output power of the laser,
   b) the wavelength of the laser,
   c) the SMMR of the laser,
   d) the linewidth, or
   e) some other laser characteristics.

3. The method as claimed in any preceding claim wherein the first matrix is determined by measuring the output values from the laser as a function of coarse tuning currents of the laser.

4. The method as claimed in any preceding claim wherein the matrix may be viewed graphically as a plane of values relating to the output power of the laser at specific controlling tuning parameters.

5. The method as claimed in any preceding claim wherein the step of processing the matrix includes the steps of:
   a) defining regions within the matrix where an edge or discontinuity is present, and
   b) determining points which are bounded by discontinuities or edges, the points determined representing stable operating regions for the specific tuning parameters.

6. The method as claimed in claim 5 wherein the step of defining regions within the matrix where an edge of discontinuity is present is performed by effecting an edge detection on the matrix values, the edge detection effecting the formation of a processed matrix set of values, the processed matrix set of values having values indicative of whether an edge is present.

7. The method as claimed in claim 6 wherein the edge detection is effected by:
   a) processing the matrix using a filter algorithm in a direction substantially equivalent to the direction of mode jumps of the laser output,
   b) determining a set of maximum points within the filtered matrix,
   c) determining a set of minimum points within the filtered matrix,
   d) establishing a set of maximum and minimum pairs,
   e) determining the difference between the maximum and minimum of each pair so as to provide a plurality of difference values, and
   f) thresholding the difference values determined such that those values greater than a certain

threshold value is defined as an edge within the matrix.

8. The method as claimed in claim 7 wherein the thresholding is performed using the value of the mode jump parameter as a threshold value.

9. The method as claimed in claim 8 wherein the value of the mode jump parameter selected is selected by selecting a sequence of values and selecting the value which provides the best result.

10. The method as claimed in any preceding claim wherein the step of determining stable operating points within the matrix set of values is effected by performing a distance map operation on the processed matrix set so as to determine distances between adjacent edges and selecting those points which are in the centre of the region bounded by the edges.

11. The method as claimed in any preceding claim additionally including the step of determining whether the determined stable operating points represent the optimum stable operating points, the step including the steps of:

a) dilating the set of stable operating points by one pixel so as to widen edges, thereby forcing the edges to join where gaps exist,
b) determining whether more than one operating point is in each dilated bounded region, and
c) if more than one operating point is found in the region above it measuring the frequency of the laser at these points,
d) determining whether the difference between the measured frequency of the laser and the mode jump

spacing is within a predetermined value and, if it is within the value averaging the plurality of operating points to provide a single operating point within that bounded region or, if it is not within that predetermined value, allowing for a plurality of points within that region.

12. The method as claimed in any preceding claim comprising the repetition of the one or more of the preceding steps at different tuning parameters so as to provide a plurality of matrices, each matrix being indicative of a set of operating points for a particular set of tuning parameters and the linking of operating points from different matrices so as to form a continuous tuning region.

13. The method as claimed in claim 11 wherein the linking of points from different matrices is effected by joining points that meet the criteria that a point from a first matrix and a point from a second matrix are joined if the point from the second matrix has a larger front and back current but these currents are within a predetermined distance value of the two operating points.

14. The method as claimed in claim 12 wherein the frequency of each operating point is measured and those operating points that are adjacent and have a frequency difference within a predetermined range are joined.

15. A method of calibrating a tuneable laser comprising the steps of:

a) measuring the output power of the device as a function of the coarse tuning sections,

b) determining an edgemap or discontinuities in the measured data,

c) defining points which are in-between the edges found,

d) repeating steps a-c for different values of fine tuning current, and

e) joining points so as to form continuous lines, the lines being determined as a function of a fine tuning current where the wavelength tuning of the laser is continuous, and being indicative of regions of continuous tuning of the laser.

16. The method as claimed in claim 15 further including the step of:

interpolating the lines found in part e to obtain the actual currents to achieve the desired output frequencies of the device.

17. The method as claimed in claim 16 further including the step of sampling the wavelength along the continuous lines prior to the interpolation.

18. The method as claimed in claim 15 further comprising the steps of:

coupling a portion of the laser light through a high finesse filter onto a photodiode, the high finesse filter being configured such that the peaks in its transmitivity are located at desired calibration frequencies of the laser,

scanning the laser across each of the lines found in part e while monitoring the output of a photodiode, and

wherein the presence of a detected output of the photodiode indicating light is present at the output of the filter is indicative that the laser is at a

required frequency for the calibration, the currents on the laser for those required frequencies being recordable so as to provide for a generation of a lookup table for the laser.

19. The method as claimed in claims 15 to 18 wherein if output power control is desired, the steps a-e are repeated for different gain currents, and the final points obtained are interpolated to find a desired output power for each output frequency.

20. A method substantially as described herein with reference to Figures 3 to 8 of the accompanying drawings.